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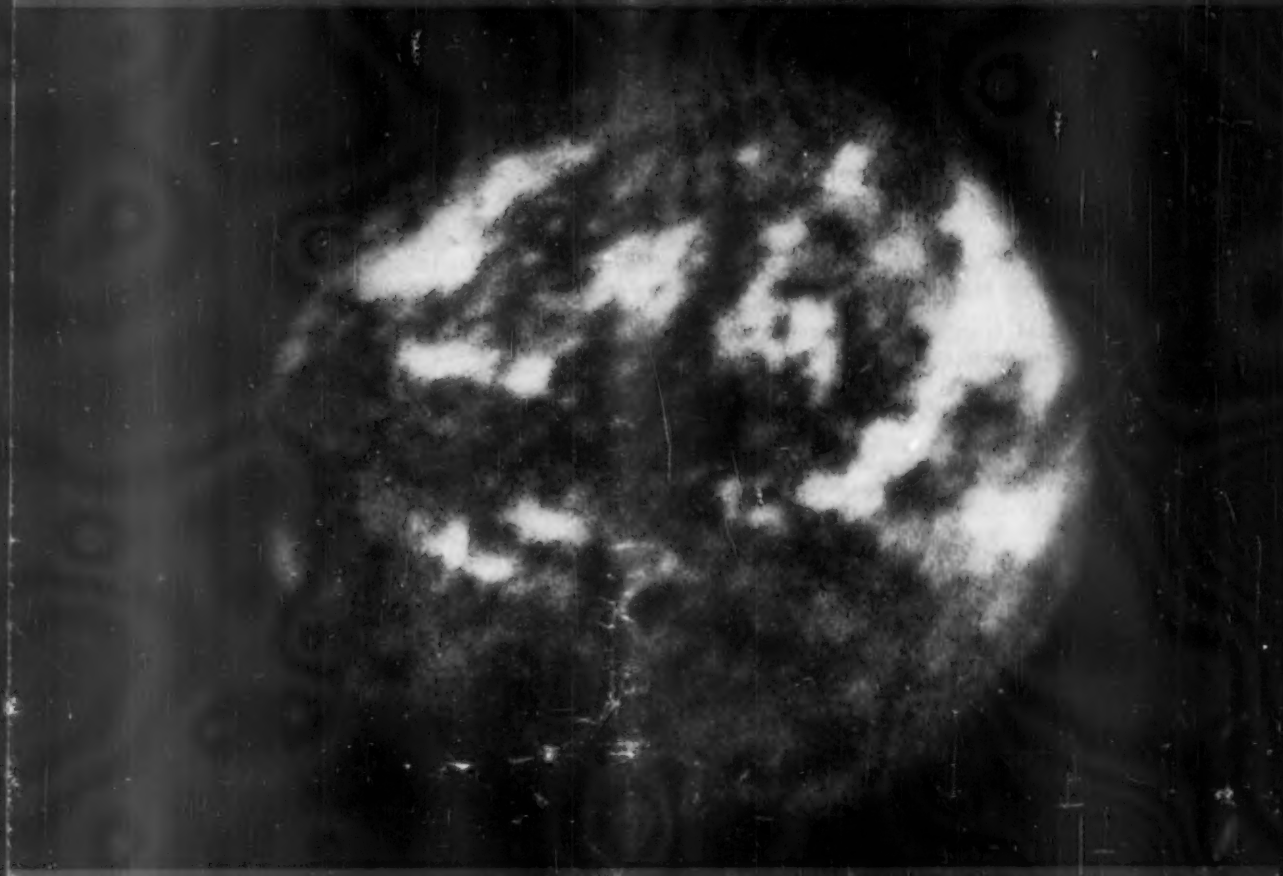
THE WEEKLY SUMMARY OF CURRENT SCIENCE



Shoot Sun Spots

See Page 227

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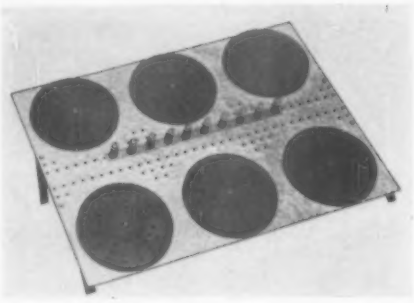

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ASTRONOMY

Solve Technetium Mystery

The mystery of how the element technetium can remain in the interior of a star has been solved, it is believed, with the discovery of a long-lived isotope.

➤ THE MYSTERY of technetium, the "ghost" element found only in certain kinds of stars or when artificially produced by atomic bombardment, is believed solved.

One form of technetium, element 43, has a half-life of 2,600,000 years, Dr. A. G. W. Cameron of the Atomic Energy of Canada, Ltd., Chalk River, Ontario, reported. Previously, he told the American Astronomical Society meeting in Rochester, N. Y., the longest-lived form of technetium known had a half-life of 210,000 years.

Dr. Cameron said the relatively short-lived technetium 99 is actually destroyed quickly in a star's interior. The isotope 97 is the one with the 2,600,000-year lifetime.

The baffling mystery had been the existence of technetium in stars when all its known forms had such "short" lifetimes, astronomically speaking. Dr. Cameron's discovery of technetium 97's long lifetime was a by-product of a recent theory concerning how stars are stoked.

Many red giant stars contain unusually large amounts of heavy elements, often including technetium. These heavy elements are built up from light ones in the interior of the star through a series of neutron captures. Providing a sufficiently potent neutron source to allow the manufacture of heavy elements has been a problem.

Dr. Cameron reported that this difficulty may now have been solved as a result of investigating the nuclear reactions that accompany the burning up of carbon by thermonuclear reactions in hot stars.

When a star is formed out of the gas and dust in interstellar space, it consists mostly of the light gas, hydrogen. The center of the star heats up and the hydrogen is converted into helium by thermonuclear reactions when the temperature is about 20,000,000 degrees absolute.

After the hydrogen has been exhausted at the star's center, the temperature rises again. At about 140,000,000 degrees, the helium is changed into carbon by a new set of thermonuclear reactions. When the helium becomes exhausted, the temperature rises again. At about 600,000,000 degrees, the carbon is destroyed, forming neon, sodium, magnesium and a variety of other relatively light elements.

Among the products of these carbon thermonuclear reactions, Dr. Cameron reported, are both protons, or hydrogen nuclei, and alpha particles, or helium nuclei. The carbon being consumed has an atomic weight of 12. It captures the protons to form a nitrogen atom of weight 13, which soon breaks down to form a rarer carbon atom of weight 13. This heavy carbon atom then captures the alpha particles to produce oxygen atoms and also neutrons.

If the star contained some iron and other similar medium-heavy atoms when it was formed, then these iron atoms will capture the neutrons. The iron atoms can thus be built up into very heavy atoms, such as observed to be so unusually overabundant in certain red giant stars. Technetium could be built in this way.

Science News Letter, April 11, 1959

ICE-FREE WATER—Compressed air lines laid at predetermined depths alongside a pier in Thule, less than 800 miles from the North Pole on Greenland's west coast, carry dense saline solutions to the surface and prevent ice formation. Bubbles can be seen surfacing in the open water area at the right. The port was kept open 40 days past its normal closing time last fall by using this system, pioneered in Scandinavia by Atlas Copco of New York.

ASTRONOMY

Find "Hot Spots" on Sun's Face in Ultraviolet Light

See Front Cover

➤ THE SUN'S face shows "hot spots" when photographed in far ultraviolet light.

The first pictures of the entire solar surface taken in this energetic, invisible light were made by scientists at the Naval Research Laboratory from an Aerobee-Hi rocket shot to a height of 123 miles from White Sands Missile Range, N. M. They showed the sun was twice as big in far ultraviolet light as it appears in the visible part of its radiation.

Eventually such rocket astronomy methods are predicted to allow routine photography of the sun's weather and how it affects the earth's high atmosphere. When viewed in the extreme ultraviolet, or Lyman alpha, light of hydrogen, the sun is "strikingly" stormy, NRL scientist Dr. Richard H. Tousey said.

The sun's Lyman alpha radiation has profound effects on that part of the earth's atmosphere lying between 40 and 55 miles above the surface called the D layer of the ionosphere, which is used for shortwave communications.

The highly detailed photographs were made with a special camera using mirrors ruled with 15,000 lines to an inch instead of lenses. A similar camera with a TV-like scanner at its focal point might be placed in an astronomical satellite within two years to telemeter its picture of the sun.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows the face of the sun when viewed from the NRL rocket on March 13, 1959.

The rocket shoot was originally scheduled as part of the U. S. International Geophysical Year program, but the launching was postponed until March 13 because the areas where the instrument payload might land were too damp.

A complicated servo system built by University of Colorado scientists was used to keep the instrument pointed at the sun during its flight. The ultraviolet solar photographs can be taken only from rockets and satellites because the radiation is absorbed high in the earth's atmosphere.

James DeWitt Purcell and Donald M. Packer worked with Dr. Tousey in the first successful effort to photograph the sun in Lyman alpha radiation.

Science News Letter, April 11, 1959

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BIOLOGY

Cause Cell Mutations

Radio frequencies in the short wave range have been found to cause chromosomal changes in plant cells, thus giving scientists a new tool for studying mutations.

➤ A NEW, POWERFUL and controlled way to cause chromosomes to mutate, or change, has been discovered. When garlic root-tips growing in water were placed between two insulated electrodes, changes took place in the plant cells.

These changes were similar to those that can be produced by cosmic rays, by X-rays, or other ionizing radiation, such as are emitted by radioisotopes.

Under the action of an electric field set up between the electrodes, the garlic root cells showed a shortening of their chromosomes, irregular cell divisions, and irregularities in the chromosomal envelope, among other changes.

The work is described by Drs. John H. Heller and A. A. Teixeira-Pinto of the New England Institute for Medical Research, Ridgefield, Conn., in *Nature* (March 28).

Electrodes were attached to an electric generator that produced radio frequencies in the megacycle (short wave) range. To minimize heating the specimen, 80 to 180 pulses per second of this radio energy were "shot" to the electrodes in bursts of one twenty-thousandth of a second for five minutes. The garlic root tips were observed 24 hours later and the cell changes were noted.

Experiments with living protozoa showed these microorganisms could move in a direction only along the lines of force while the electric field was on. As soon as it was switched off, they resumed a random movement.

Heating of the cells was low enough not to hurt the viability of either these organisms or mammalian cells, the scientists reported.

"In a larger immobilized micro-organism we were able to observe intracellular orientation of subcellular particles," they said. "This led us to believe that this force might be used as a powerful and controlled mutagenic agent."

The method may be used to induce cellular changes to a degree depending upon frequency, pulse, power, exposure time, and the way the cell lines up its axis with respect to the electric field.

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GEOLOGY

Study Earth's Interior

New computations of the temperatures found within the earth, including its solid core and its mantle, indicate the earth's interior is much cooler than had been estimated.

➤ THE EARTH'S interior is much cooler than most scientists have estimated.

New temperatures for the earth's solid core and its molten blanket were presented to the American Physical Society meeting in Cambridge, Mass., by Dr. Herbert M. Strong of General Electric Research Laboratory, Schenectady, N. Y. They are based on the melting point of iron under very high temperature and pressure. Iron is thought to make up both the earth's center and its liquid surrounding.

At the earth's center, some 4,000 miles straight down from Cambridge, the temperature is estimated by Dr. Strong to be 6,300 degrees Fahrenheit. At the boundary where molten iron meets solid iron 900 miles back towards Cambridge, the temperature is approximately 4,700 degrees. Previous theoretical calculations for this liquid-solid boundary ranged from 5,400 to 7,200 degrees Fahrenheit, Dr. Strong said.

The physicist has also calculated the temperature at the boundary where molten iron meets the earth's mantle some 1,800 miles from the earth's surface. He found it to be about 4,260 degrees Fahrenheit.

The farthest man has been able to penetrate the earth's crust, Dr. Strong said, has been about a mile in search of diamonds. Ironically, Dr. Strong bored into the earth's surface on paper using measurements from an instrument that has produced man-made diamonds, GE's super-pressure cooker.

Iron has a higher melting point under greater pressure, which is why, theoretically, the earth's center can be solid iron surrounded by liquid iron. Up to now, most calculations of the earth's inner temperatures have been based on what has been known about the melting point of iron at one atmosphere of pressure, pressure at sea level, which is about 2,786 degrees Fahrenheit. Using the diamond-making instrument capable of pressures up to 150,000 atmospheres, Dr. Strong found that iron's melting point rises to about 3,132 degrees Fahrenheit.

He then extrapolated from these new data and calculated what temperatures of iron would be in the earth's center where the pressure is 4,000,000 atmospheres as well as at the boundary layer where the pressures range from 1,350,000 to 3,000,000 atmospheres.

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TWISTING TOWER—A surveyor's transit aimed at a mirror on top of the 260-foot microwave tower helped determine that the structure twisted only one-half of one degree under loads equal to 85 miles per hour winds. Wires at the right connect strain gauges placed at critical points on the tower with instruments in a laboratory on the ground.

ASTRONOMY

Nitrogen Tetroxide Found In Jupiter's Atmosphere

➤ NITROGEN tetroxide has been discovered in the atmosphere of Jupiter, three scientists reported to the American Astronomical Society meeting in Rochester, N. Y.

The compound, made up of two atoms of nitrogen and four atoms of oxygen, was found by scanning the rainbow-like spectrum of sunlight reflected by Jupiter's atmosphere. Dr. C. C. Kiess and Mrs. Harriet K. Kiess, with Dr. C. H. Corliss, made the spectographic studies of Jupiter's light at the Slope Observatory of the U. S. Weather Bureau on Mauna Loa, Hawaii. The scientists are affiliated with the National Bureau of Standards and the National Geographic Society.

Besides the nitrogen tetroxide, they also studied the ammonia and methane found in Jupiter's atmosphere.

The structures of the following bands in the red and near infrared were measured: for the 6450 and 7900 bands, attributed to the ammonium molecule, 50 and 135 lines, respectively; for the bands at 6200, 7200, 8400, and 8600, attributed to the methane, 25, 25, 40, and 25 lines respectively. Many of the lines in these bands are not identifiable with published rotational lines of the bands of these molecules, the scientists said.

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METEOROLOGY

Weather Modification

Efforts to modify the weather can be expected to be hampered by the many problems involved, including scientific, political and economic ones.

➤ THE PROBLEMS involved in weather modification are many, very difficult to solve and not likely to be solved soon.

This conclusion of Dr. Jule G. Charney of Massachusetts Institute of Technology on the highly speculative subject of man's changing the weather was reported to the American Meteorological Society meeting in Chicago.

He said the problems involved in weather modification were, on a much larger scale, exactly like those involved in seeding clouds with chemicals to try to wring rain from them: What would have happened if the clouds had been allowed to progress naturally?

For many cases of cloud seeding, a relatively small scale effect, the answer can be found statistically. This is not the case when the effects are widespread, as they would be if weather could be modified, because not enough is known about the atmosphere.

Dr. Charney said the problems of predicting the effects produced by interfering with natural processes are political, economic and moral ones. He predicted that no country would attempt an experiment aimed at changing the weather if there were much chance that the effects would be bad for its own population.

Dr. Harry Wexler, the Weather Bureau's director of meteorological research, said the "cure" of weather modification may be "worse than the ailment." He urged that no attempts at making large-scale weather changes should be made until all possible effects have been evaluated, using objective methods involving realistic models of the general circulation.

A qualitative study by Dr. Wexler showed that making an artificial ice cloud over the Arctic Ocean to raise the temperature around the North Pole would give persons living in the latitudes from 50 degrees to 65 degrees north winters with heavier than normal precipitation. In North America, the heavy snows would blanket an area roughly from the Canadian border north nearly to the Arctic circle. They would also fall on most of northern Europe and virtually all of Russia.

Persons living in latitudes from 35 to 50 degrees north, on the other hand, would likely have less winter precipitation than normal. Since such regions as southern California and the Mediterranean derive most of their annual precipitation during the winter, the climate there might become more arid if winters were milder.

Dr. Wexler emphasized that he does not consider it very practical at this time to make and maintain a widespread artificial ice cloud over the Arctic.

The Russians keep secret some of their research concerned with weather modification, scientists at the Meteorological Society meeting learned.

Dr. Louis J. Battan of the University of Arizona's Institute of Atmospheric Physics said his survey of Russian reports dealing with cloud physics showed "some Russian work in cloud seeding has been, and continues to be, classified."

He reported research in the field of radar meteorology (studying clouds and storms by bouncing radar waves from them) is probably also classified.

"In the field of cloud seeding and weather modification," Dr. Battan said, "the number of Russian reports dealing with Russian work has been quite small considering the importance of the subject."

Dr. Battan presented his views as one of a panel of five experts, each of whom discussed one aspect of meteorology in the Soviet Union. This new method of programming all reports at an American Meteorological Society meeting was termed very successful by weathermen attending the Chicago meeting where it was tried for the first time.

Dr. J. Robert Stinson of Saint Louis University, St. Louis, Mo., a panel member, said there was a growing realization that scientific superiority may be necessary for United States survival. This requires evaluating the current and future status of Russian and American meteorological research.

Dr. Stinson said he is convinced that the American and Western World weather research is, over-all, now superior to that of Russia. However, if present programs of both countries continue unchanged into the future, Russia will "catch up and eventually pass us in research potential."

He called for a more effective program for recruiting, training, supporting and rewarding weather researchers.

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METEOROLOGY

Weather Bureau Will Fly Airplanes Into Hurricanes

➤ THE WEATHER Bureau will use two leased airplanes to fly into hurricanes this summer to learn more about the structure, growth and paths of these storms.

Dr. F. W. Reichelderfer, Weather Bureau chief, said two Douglas DC-6's will be equipped with especially designed meteorological instrumentation to measure and record dozens of kinds of weather information while the planes are in the storm area.

Besides the two leased planes, which will be used for atmospheric research at middle and low flight levels, the Weather Bureau will use a B-57 light bomber to carry out investigations at all higher levels up to 50,000 feet. The B-57 will be loaned by the Air Force, which will also provide considerable highly specialized navigation equipment for installation on all three aircraft.

The planes will be based at Miami International Airport during the coming hurricane season, which normally covers the period June 15 to Nov. 15.

The Weather Bureau's National Hurricane Research Project was started in 1956 in collaboration with many other interested agencies. Its aim is to conduct extensive research into the formation, development, movement and death of destructive tropical storms. This research will also make possible evaluation of various proposals for modifying or controlling hurricanes that approach coastal areas.

Dr. Reichelderfer said the three flying weather laboratories will give the U. S. the most completely equipped atmospheric research aircraft in the world.

Besides the three civil hurricane research aircraft to be operated by the Weather Bureau during the 1959 season, the famous "hurricane hunter" planes of the Navy and Air Force will continue their storm location and tracking flights whenever a tropical storm is brewing in the south Atlantic Ocean, Caribbean Sea or Gulf of Mexico.

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ASTRONAUTICS

Gun Developed to Control Weightless Travel

➤ STUDIES are underway to develop a propulsion gun that would enable a spaceman in a weightless condition to control his movements, the Air Research and Development Command has reported.

The slightest effort or motion would propel the weightless space voyager in the direction opposite to the motion. By using a propulsion gun, it is believed he would gain control of his movements simply by "firing" the gun to start, stop or change direction.

Studies on this so-called "reactor gun" are being made at ARDC's Wright Air Development Center in Dayton, Ohio, during the 12 to 15 seconds of weightlessness experienced in a C-131B airplane flying a kaplerian trajectory (an arc flown to produce weightlessness).

In this procedure, the plane dives from 12,000 feet at a ten-degree angle until it reaches a speed of 250 miles per hour. After a two-and-a-half g pull-out, it coasts in an arc, during which it and its contents become weightless for 12 to 15 seconds.

The present propulsion gun consists of a package of high-pressure air bottles, a short length of hose, a nozzle, and valves for controlling the amount and direction of the air discharged.

The weightless man, either within his cabin or outside the space ship making repairs, would hold the nozzle in his hand, aim it directly away from the point to which he wishes to go, and press the handle.

The reaction of the high-pressure air rushing out of the nozzle would provide sufficient force to propel the man from one point to another.

Science News Letter, April 11, 1959

FOOD TECHNOLOGY

Army Beats Bread Problem

➤ A PINCH of sodium bicarbonate, a spoonful of gluconic acid lactone and a bit of broth—mix well with flour and liquid and you have an answer to the bread problem: bread without yeast.

Yeast and the complicated process of fermentation, still pretty much an unknown, is recognized as a major stumbling block to producing large quantities of bread quickly and of uniform quality that would "keep." Now this stumbling block seems to have been removed with the development of a new instant mix.

So far the bread mix has been tried out on a pilot plant scale with 400- and 500-pound samples being tested, Dr. Samuel A. Matz said. Dr. Matz is chief of the cereal and general products branch of the U. S. Army's Quartermaster Food and Container Institute, Chicago. The mix almost matches average commercial bread, he said, and is "a good deal better" than the canned bread now being used for the armed forces.

The new instant bread mix will allow increased efficiency in supplying fresh bread to troops in the field, Dr. Matz told researchers at the meeting in Washington, D. C., of Research and Development Associates. The most efficient field bakery unit now uses 250 men to supply 100,000 soldiers. In contrast, three men using the instant mix could supply fresh bread quickly and efficiently to 2,000 men, a basic unit in the Army.

Today 50 specialized trailers are needed to carry the field equipment needed for conventional bread baking. Future units could consist of equipment mounted permanently on one vehicle as a small portable bakery, Dr. Matz said. Bread could be extruded in small, one and one-third ounce dough pieces, one at a time, he explained.

Sodium bicarbonate as the gas source, together with gluconic acid as the acid part of the leavening system, produced a bread with "good texture" and "satisfactory" internal appearance, Dr. Matz told the scientists. Bread flavor has to be added since the yeast is absent. Quartermaster researchers found the addition of a simple broth containing yeast, sugar and a buffering agent gave bread with better flavor than canned bread.

Dehydrated Foods

➤ PRE-COOKED, dehydrated meals, complete from soup to apple sauce, may be the answer to a soldier's prayer.

They may also answer some of the meal problems for cooking in submarines, airplanes, large institutions and even the home kitchen, said Dr. Virgil Wodicka, director of the Quartermaster Food and Container Institute's food division.

The quality of these precooked, dehydrated foods is probably the best of any dehydrated foods, he said, with the additional advantage of not requiring any cooking. Such foods can be kept for long periods of time without refrigeration and can be "cooked" quickly and simply with the addition of either hot or cold water.

With the change in tactical concepts of war, caused by atomic weapons, the armed forces face the problem of supplying food to widely scattered troops. Meals of dehydrated, cooked foods are the best answer to this problem, Dr. Wodicka explained.

Troops at the Combat Development Experiment Station, Fort Ord, Calif., will use the new rations for three weeks under simulated combat conditions. This first test of the new foods is scheduled for the end of May, Dr. Wodicka said.

He reported plans for using the foods to the Research and Development Associates, an organization made up of industry, institutions and Governmental representatives concerned with food technology.

Science News Letter, April 11, 1959

MEDICINE

Tumors Cause Tumors

➤ THERE IS EVIDENCE suggesting that one specific type of tumor can cause the growth of several different types of tumors.

Thus, specific tumors may be carrying a hidden potential that is triggered only under special circumstances to produce different growths, Dr. Ludwik Gross of the Veterans Administration Hospital, Bronx, N. Y., reported.

The hidden potential may be a virus or several viruses, he said.

Dr. Gross has been experimenting with leukemia, cancer of the blood, in mice. He found that when he exposed the mice to radiation, they developed leukemia.

Now he has been able to filter off from the cancerous cells a free substance that he suspects is a virus.

This free substance, when injected into animals that have not been exposed to radiation, causes leukemia.

However, Dr. Gross found that if he removed the thymus, a gland located above the heart, the mice did not develop leukemia when they received the injection. Even when the mice received the injection before the thymus was removed, the leukemia disappeared when the gland was taken out.

Doctors today do not understand the exact role played by the thymus, but Dr. Gross suspects that in this particular case the gland acts as a shelter for the virus where it can multiply.

Some of the mice injected with the virus-like particles developed not leukemia, but tumors of the parotid glands or subcutaneous sarcomas. The leukemic filtrates may contain a mixture of cancer-causing particles, Dr. Gross suggested. On the other hand, it is entirely possible that tumors themselves carry the potential to induce other types of cancerous growths.

➤ THERE ARE between 50 and 100 known viruses that cause cancer in animals.

Yet, it has been only within the past two years that viruses have been accepted by scientists as a cause of cancerous diseases such as leukemia, Dr. Joseph W. Beard of Duke University said.

There is a growing suspicion among researchers that one form of leukemia, or cancer of the blood, is contagious, Dr. Howard B. Andervont, National Cancer Institute, Bethesda, Md., said. The incidence of leukemia is constantly rising, he pointed out.

The theory that viruses cause cancer is not a very old one. It has been established that a virus causes tumor growths in rats, rabbits, hamsters, mice and chickens, Dr. Andervont said. Recently, researchers found the same virus would cause tumors when injected into mice, hamsters and rats.

If scientists can find a method by which human tumors can be as successfully injected into animals, researchers will have available an exciting new tool, animals with human tumors that can then be experimented upon and observed.

Dr. Andervont said successful injection of a tumor-producing virus into several different species of animal does not prove that viruses cause human cancer, but it would be surprising if humans were the exception.

Dr. Harry Rubin of the University of California, Berkeley, said that a simple accumulation of virus can cause a reaction in a cell that results in different types of cancers. Dr. Rubin's work recently established that a virus from a cancerous growth in an animal, when placed in a culture, is capable of not only continued growth, but also of forming a cancerous lesion in the cultured growth itself.

Spontaneous regression of a cancer is another problem facing the scientists. However, doctors studying this process now suspect that the body has some type of host resistance, an immunity as it were, toward tumors, Dr. Warren H. Cole of the University of Illinois said.

Initial studies on spontaneous regression by Dr. George Moore of Roswell Park Memorial Institute, Buffalo, have revealed that lymphocytes and plasma cells gather around tumors. These might be just the workers that cause spontaneous remission, Dr. Moore speculated.

The fact that a malignant growth can flare up at any time, even though live tumor cells had been circulating in the patient's body without causing malignancy, seems to point to the break down in the body's defense mechanism. This may be the explanation for metastasized tumors or cancerous growths that have spread from the main tumor via the circulatory system, the lymphatic system or by other means.

Results of these tumor and leukemia studies were reported to a group of science writers at an American Cancer Society seminar in Excelsior Springs, Mo.

Science News Letter, April 11, 1959

ASTRONOMY

Pacific's White Ash Shows Possible Comet Collision

➤ A LAYER of clean white ash discovered on and beneath the bed for the Pacific Ocean may record a possible comet collision with earth in ancient times.

The layer might also result from widespread volcanic action, Columbia University scientists say. Until the age of the very fine-grained ash of glassy fragments and the extent and identification of the deposit are determined, geologists can only speculate concerning its origin.

The discovery was made by scientists aboard Columbia's research vessel Vema and is reported in the *Proceedings of the National Academy of Sciences* by Dr. J. Lamar Worzel, assistant director of Lamont Geological Observatory, Palisades, N. Y.

The ash was found over a large area of the tropical eastern Pacific. Dr. Worzel says sub-bottom sound reflections indicate the layer extends at least 750 miles north of the equator and about 825 miles south of the equator within a few hundred miles of Central and South America.

He reports that the ash ranged from an inch to a foot in thickness and the layer rises to the ocean floor in some areas and is as deep as 120 feet below the ocean bed in others. He says it was found in places where the ocean ranges from a little less than a mile to more than three miles deep.

Dr. Worzel says the ash was deposited "fairly recently," possibly within the last 100,000 years, and probably fell within a relatively short time, such as a year or so.

In a paper accompanying Dr. Worzel's report, Dr. Maurice Ewing, director, Bruce C. Heezen, submarine biologist, and David B. Ericson, geophysicist, all of Lamont Observatory, say that the single ash layer over such a wide area "must record a notable event in the history of the area."

Science News Letter, April 11, 1959

PUBLIC HEALTH

Flu, Polio, Hepatitis Increase During March

➤ THE MONTH of March witnessed an increase in poliomyelitis, influenza and hepatitis.

The current outbreaks of influenza have occurred in approximately 20 states, a U. S. Public Health Service spokesman said.

Furthermore, influenza is expected to spread around the country more extensively before the expected decline in late April.

The PHS reports increased absences in schools due to influenza and influenza-like illnesses are on the rise. Death rates for the 114 large cities in the United States have remained normal, however.

Weekly reports from the PHS indicate the incidence of poliomyelitis is again slowly climbing. During the first 11 weeks of 1959, 249 cases of polio were reported, compared to 172 last year. More than 170 of the 249 cases reported so far this year are paralytic. Ninety-six of last year's cases were paralytic. The remainder consist of non-paralytic and unspecified polio. Better reporting may be responsible for the apparent increase in the number of paralytic cases this year, the PHS spokesman said.

As the U. S. swings into its polio season, PHS officials have expressed concern for the millions of Americans who have not received Salk protection. The number of recorded cases of all types of polio is expected to increase steadily in the immediate future.

Meanwhile, in addition to the flu and polio virus battles, hepatitis still continues to gain ground. The latest PHS data show that 6,195 cases have been reported during the first 11 weeks of this year while 3,576 occurred last year over the comparable period of time.

This current pattern of the liver-damaging disease is similar to the last serious outbreak in 1956.

Science News Letter, April 11, 1959

ANTHROPOLOGY

Scientists Urged to Dig for Specimens of Peking Man

➤ GIVE UP the loss of the bones of ancient Peking Man, one of man's earliest ancestors, as a "perfect crime," and start digging for new specimens of this Pleistocene forebear.

This is the advice to anthropologists contained in *Science* (March 27).

The famous bones were lost to science during the confusion of World War II. Negotiations had been completed to ship the precious specimens to the United States for safe keeping during the hostilities and the bones in three cases were given to U. S. Marines who were being evacuated from Chinwangtao. But the ship ran aground in the Yangtze Kiang River, the Marines were captured, and no one knows what happened to Peking Man.

In recent years, the Communist Chinese have charged that Americans stole the bones of Peking Man and are keeping them hidden in America. This charge was traced to an "honest mistake" by a British paleontologist, Prof. D. M. S. Watson. Prof. Watson, on a visit to the American Museum of Natural History in New York, was shown another ancient skull from Java, Solo Man. He mistook this for the missing skull of Peking Man. He mentioned the incident to a colleague in East Germany and from there the report, somewhat embroidered, spread to Communist China.

In the meantime, anthropologists may have already resumed digging at the Choukoutien cave, site of the original find of Peking Man. Announcement of renewal of the search was transmitted to the journal *American Anthropologist* by Hallam L. Movius Jr. of Harvard University who dug out the information from a Communist China propaganda sheet and from Russian reviews of reports of Chinese scientists.

Although anthropologists in this country do mourn the loss of the orginal bones of Peking Man, they do not believe that it does irreparable damage to science because excellent casts of the bones are available in various parts of the world which can be used for study.

Science News Letter, April 11, 1959

IN SCIEN

OCEANOGRAPHY

Discover "Hot Spot" on Pacific Ocean Floor

➤ A "HOT SPOT" stretching some 3,600 miles along the floor of the eastern Pacific Ocean in a relatively narrow band has been discovered.

Dr. R. Von Herzen of Scripps Institution of Oceanography, La Jolla, Calif., says the band of high heat flow in the earth's sub-oceanic surface appears to be associated with the East Pacific Rise, a broad elevated region. The trenches bordering this rise on each side, on the other hand, appear to be associated with low heat flow.

Dr. Roger Revelle, director of the Scripps Institution, has said that such measurements of heat flow changes in the Pacific Ocean indicate the earth's interior is slowly churning over in giant blocks hundreds or thousands of miles in size. Radioactive heating at great depths is thought to cause rocks deep beneath the surface to flow upward in some places and downward in others.

The heat flow rates were found to be 50 times higher in some regions than in others, Dr. Von Herzen reports in *Nature* (March 28).

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PHYSIOLOGY

Shrew's Skull Grows When Spring Comes

➤ IT IS SPRING and right now some shrews' skulls are increasing in size.

The brain cases of the Common Shrew, a mouselike animal, have been increasing ever since January, two British scientists report, and they will go on increasing until July when the skulls will begin decreasing in size, particularly in depth.

This "striking seasonal fluctuation," which is also found generally in the shrew's weight and length of body, is a real variation in the depth of the animal's brain case. It is not due to errors in measurement nor to the presence of smaller individuals, report Peter Crowcroft and Jean M. Ingles of the British Museum of Natural History in London.

The depths of the brain cases of 423 shrews, *Sorex araneus*, were measured using a specially designed instrument. The size averaged about five millimeters in October followed by a decline to less than 4.7 mm. in January and a maximum of more than 5.1 mm. in July.

Greater seasonal variations are found in shrews living in colder winter climates, the scientists explained.

"Similar studies of shrews from various regions of North America would be of great interest," they conclude in *Nature* (March 28).

Science News Letter, April 11, 1959

CE FIELDS

ASTRONOMY

Twin Stars Found Stellar Lightweights

➤ TWIN STARS have been found to be stellar lightweights, each of the pair having the smallest mass of any known star.

The double star is also one of the closest to the earth, only five others being nearer. Dr. Peter van de Kamp, director of Sproul Observatory, Swarthmore, Pa., reported that the twin stars take 200 years to make a complete circuit around each other.

He told the American Astronomical Society meeting in Rochester, N. Y., that the double star known as L726-8 has a combined mass only 79-thousandths that of the sun. The individual masses of each star are only 44-thousandths and 35-thousandths that of the sun.

Dr. van de Kamp said measurements on photographs taken during the last ten years showed the twin stars' very slight motion against the background of more distant stars. From these measurements, he calculated that L726-8 is 8.6 light years from earth. (A light year is the distance covered in one year by light traveling at 186,000 miles a second, or about six trillion miles.)

The only nearer stars are the sun, 93,000,000 miles; Alpha Centauri, 4.3 light years; Barnard's star, six light years; Wolf 359, 7.7 light years; and Lalande 21185, 7.9 light years.

The next lighest weight star known is Ross 614B, which is also the second faintest star known. It is only one-twelfth the mass of the sun and 70,000 times fainter.

Dr. van de Kamp said the new measurements furnish a "substantial extension" of the fainter end of the mass-luminosity relationship, the link between a star's mass and its real brightness, or absolute magnitude. The absolute visual magnitudes of the twin stars in L726-8 are 15.35 and 15.85.

Science News Letter, April 11, 1959

AGRICULTURE

Radioistopes May Make Pesticides Obsolete

➤ RADIOISOTOPES may in a few years make the 2,4-D's and the DDT's as obsolete as we all hope war has become.

Our efforts to control plant and insect pests should be as selective as our system of criminal justice, Atomic Energy Commissioner John F. Floberg told researchers at the fourth annual Conference on Radioisotopes in Agriculture, meeting in Stillwater, Okla. Condemning "indiscriminate spraying against the gypsy moth" and "broadcast spraying against the fire ant," Mr. Floberg foresees an opportunity for radioisotopes to contribute better ways of controlling these pests.

Noting the recent advances in the use of radioisotopes in agriculture, Mr. Floberg explained the AEC has two major interests in the field: determining the effect of radiation on plants and animals, and encouraging the use of atomic energy products and techniques in fundamental and applied research.

Research with isotopes ranges from metabolism studies of the cow's germ cells to the effect of ionizing radiations on root growth. Most of this research is basic, thus contributing to our knowledge about plants and animals, Mr. Floberg said. As far as practical applications of radioisotopes go, there have been several promising results.

The current U. S. Department of Agriculture's campaign to exterminate the screwworm fly in Florida is very successful. Researchers are considering using radioisotopes to control other insect pests. A second practical contribution is the production of new plant varieties by using radiation to induce mutations.

Science News Letter, April 11, 1959

PSYCHIATRY

Sleeplessness Suspected In Schizophrenic Illness

➤ PROLONGED insomnia is suspected as precipitating some cases of schizophrenia.

Schizophrenia is called the "split personality" mental disease. Victims become disoriented and lose contact with reality.

Many persons on the brink of a psychotic break suffer from severe insomnia, the inability to sleep. A few pass through a prolonged period of wakefulness as the schizophrenic process unfolds, three Salt Lake City doctors report in the *Archives of Neurology and Psychiatry* (March).

Such sleep deprivation, when combined with isolation and incapacitating anxiety, may have an illness-causing potential that has not been fully appreciated.

Experience with two patients who suffered severe emotional disturbances coupled with sleeplessness and followed by outright psychotic attacks aroused the doctors' interest.

Both patients were "racked with intense psychological pain and overwhelmed by seemingly insoluble problems." Both failed to sleep for several days, emotionally isolated themselves, and became psychotic. The schizophrenic episode was brief in each case, and the patients recovered rapidly with treatment, Drs. Eugene L. Bliss, Lincoln D. Clark and Charles D. West of the University of Utah College of Medicine and the Veterans Administration Hospital, Salt Lake City, report.

Further tests on medical students revealed that sleep deprivation for 72 hours resulted in confusion, inability to judge the passage of time, and other intellectual deterioration to their minds.

The doctors say no subject became psychotic.

"One can only infer that if these changes were to occur in someone who was also profoundly anxious and deprived of group support, more serious psychopathological sequelae (consequences) might result," the doctors suggested.

Science News Letter, April 11, 1959

OCEANOGRAPHY

Winter "Shrinks" Ocean, Pt. Barrow Study Shows

➤ FREEZING winter temperatures "shrink" the water of the Arctic Ocean and, as a result, tide variations at Point Barrow, Alaska, are 20 inches lower in winter than in summer.

This was discovered by M. Allan Beal, oceanographer with the Scripps Institution of Oceanography.

Mr. Beal has been making year-around hydrographic observations through the ice at Point Barrow in an International Geophysical Year study program to learn basic facts about seasonal changes in Arctic Ocean tides.

To measure seasonal fluctuations of the tides at Point Barrow, Mr. Beal adapted a tide gauge into the first known automatic tidal station in the Arctic. This instrument registers the tide's extreme high point to be in August and its lowest point in April.

To explain the fluctuation, Mr. Beal and his assistants established 22 observation stations off Point Barrow, keeping constant observations the year around. To get from station to station when ships were unable to pierce the ice, they rented airplanes which could land on the ice.

Then they cut holes and lowered Nansen bottles through them. This procedure showed that the water under the ice in the winter is saltier and denser than summer water. The volume, being reduced, explained the lower winter tides.

Mr. Beal has been on this Arctic tide-investigation assignment for four years. The Point Barrow laboratory is staffed with 30 to 36 scientists and technicians, and about 100 maintenance men.

Science News Letter, April 11, 1959

BOTANY

Weeds Highly Resistant To Gamma Radiation

➤ A COMMON, blue-flowered herb named Speedwell is described as "one of the most radio-resistant plants known."

While investigating the doses of gamma radiation needed to prevent weed seeds from growing, two British scientists report that Speedwell could take more than 100,000 rad. (A rad is a unit of absorbed radiation dose.)

In contrast, another weed, *Anisantha sterilis*, was found remarkably radiosensitive since only 5,000 rad was lethal.

"The results obtained indicate that arable soils need treatment with at least 100,000 rad of gamma radiation to inhibit weed growth effectively," H. J. M. Bowen and S. R. Smith of the Wantage Radiation Laboratory, Grove, England, say. This treatment, they point out, would sterizile any insects or nematodes in the soil as well as probably destroying a high percentage of bacteria and fungi.

Details of the research appear in *Nature* (March 28).

Science News Letter, April 11, 1959

EDUCATION

Soviet-U. S. Education

An expert urges that an evaluation of American education be kept clear of narrow considerations of military technology and a numbers race with the Russians.

By DR. DEMITRI B. SHIMKIN

Supervisory Statistician
Foreign Manpower Research Office
U.S. Bureau of the Census

➤ IN GENERAL, my broadest impression is that educational goals in the two countries are basically different. Soviet education is a State training program preparing personnel for planned, predetermined positions in the labor force. American education seeks, in contrast, to develop the inherent capacities of individuals so that they might lead socially useful lives and exercise reasonable judgment as citizens.

Soviet training and tests are oriented toward meeting specified performance standards, while American pedagogy attempts also to identify potential abilities and to remedy learning difficulties. Finally, Soviet education maintains student effort through graded material and social incentives commensurate in scale with the State's evaluation of the job to be filled. American education assumes internal motivation on the student's part; furthermore, in this country, educational attainment, economic success, and social status have only moderate intercorrelations.

Another basic contrast is in the degree of structuring of hierarchical order and centralized direction in the two educational systems.

In the Soviet Union, missions, priorities, and means are set by the Communist Party and State. The training of a Party and technological leadership, and of a body of skilled technicians dominate all programs. This concentration has produced unquestionable results. It has also led to an annual retardation and drop-out rate of 20% for primary and secondary education as a whole. That in turn has drastically limited average educational attainments; even in 1955-56, only a third of the industrial workmen, a young and rather select lot, had completed the seventh grade.

In the United States, informal mechanisms and pragmatic adjustments have played vital roles in the total educational scene. For example, the county agent system and the Four-H Clubs have contributed greatly to the technological level of American agriculture.

In industry and commerce, the labor unions and business have exercised much influence upon the content and methods of vocational curricula, and even developed extensive programs of apprentice training and intramural education. In many fields, professional societies have built up standards.

Finally, the loose fabric of American society has permitted substantial occupational mobility to meet shifting demands for skills. In sum, American education should not be judged in terms of its humane objectives and formal structure alone. An equally vital test is the proven quality of the working labor force.

The differences between the educational systems of the two nations are counterbalanced by a number of major similarities. Most important is a common vision of an improving society, made possible by universal, publicly financed education. Yet neither country has been able to achieve equality of educational access for all its citizens. In the Soviet Union, the rural areas remain severely deprived; in the United States, race and region are the pertinent variables. Furthermore, both nations depend upon elite institutions—the thirty-odd universities in the U.S.S.R. and leading private schools and colleges in this country—to provide key leaders.

However, the Soviets have no counterpart to our large state universities, with their traditions of practical service to their communities, and with their educational policies of easy entrance but severe attrition. Finally, the great dynamism of both nations has opened avenues of mobility in and out of professional occupations, differences in institutions notwithstanding. As a result, conditions of personal advantage (from the standpoints of security and satisfaction, as well as economic gain) have profoundly modified the formally directed effects of the two educational systems.

RUSSIAN SCIENCE SKYSCRAPER ***—A symbol of the Soviet push in science education is the University of Moscow science skyscraper that dominates the Russian capital. This scientific manpower factory is a key factor in the Soviet effort to best the United States scientifically and technologically. A statue of the Russian physicist Lebedev sits guard in the foreground.***

At various educational levels, the Soviet Union manifests both strengths and weaknesses in comparison with the United States. Thus, while differences in pattern are evident, no simple qualitative judgment appears plausible.

Senses in Grade School

The Soviet grade-school curriculum resembles that of our better progressive schools in its stress on natural history and on observation. Soviet children are conditioned to use their eyes, ears, and hands. They gain a feeling for their environment through nature walks, excursions, and simple experiments. Soviet elementary textbooks are generally good; they are clear, simple, and informative.

The weaknesses of Soviet elementary schools derive from the low standards of teacher training, since only secondary education is required to instruct in these grades, and the pay is poor. In addition, classes are large, with double and even triple sessions common.

At the junior and senior high school level, the Soviet school system gives far more formal content, especially in mathematics and physics, than do all but a few American schools. The teaching of chemistry does not seem as good; that of biology, rather poor. The teaching methods used are didactic, with the experimental approach little stressed. There are no Science Fairs. The quality of Soviet secondary training is hard to judge, for the actual, representative test scores achieved in State examinations are not published. Over-all, the average Soviet high school graduate probably knows more facts and handles mathematics better than the average graduate of an American academic high school. Whether many reach the substantive, creative, and motivational levels of our best schools is another question.

In higher education, both countries exhibit vast internal differences. The Soviet universities give training in the physcial sciences equal to the finest in the world; conversely, the narrower institutes, with their minute faculties and shop-practice orientation, are often poor indeed. In biology, Soviet standards are generally low; ours are low in many of the earth sciences. An over-all assessment is difficult to make.

The Soviets have some serious weaknesses in their graduate training. Much time is wasted preparing for examinations on Marx-

ism, and the quality of foreign-language skills is low (as in the U. S.), popular mythology to the contrary notwithstanding. They have, at the same time, two basic assets in advanced training: 1. The intimate integration of their graduate training with the nation's leading research institutes, as contrasted to the isolation of graduate schools from industrial and governmental research in the U. S., 2. The close individual-guidance system by which each faculty member has a very few persons whom he carefully develops. This gives an intensity of training rarely achieved in this country. It appears to be adequately supplemented, moreover, by graduate-student participation in staff conferences.

Course Work De-emphasized

There is little emphasis upon course work, since most of that is completed at the undergraduate level. On the American side, the comprehensive general examinations prior to candidacy for the doctorate degree are perhaps the major feature of advantage vis-a-vis the U.S.S.R.

In sum, Soviet education, while inapplicable as a general model, offers numerous features which can be studied and even adopted with profit in this country. The systems of other nations, particularly in Western Europe, also present much that is challenging. But a consciousness of a strong American educational tradition is equally important.

Above all, I would urge that evaluations of American education be kept clear of narrow considerations of military technology or a race in numbers with the Soviet Union. The Sputnik and allied developments represent the payoff of a long-continuing effort by men who were trained, not in today's narrow formalism but in the 1920's, when Dewey's philosophy was strongly influencing Soviet practice. The lessons of these accomplishments relate visibly, not to questions of general education, but to specific problems of military-scientific planning and coordination. They must also be viewed in relation to the distortion of research effort which they have imposed on Soviet science and technology, particularly in the constriction of resources in fields such as medicine and agriculture.

Loud Alarms

The problem of scientific personnel strength is one of great complexity. It must suffice here to say that much excessive alarm in this regard has been aroused by conceptually invalid comparisons and by failures to take into account specific demographic fluctuations, including war-caused peaks of delayed education. In general, while the Soviet Union currently has a greater output of first-degree graduates in a number of professional fields, both present total strengths and the outlook a decade ahead is definitely favorable to the United States.

The problem in fact will be one of making available facilities and jobs rather than that of a potential scarcity of human resources.

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ACTION FOR SCIENCE UNDER NDEA—*Nat. Science Teachers Assn.*, 22 p., paper, single copies free upon request direct to publisher, 1201 - 16th St., N.W., Washington 6, D. C. Report of a conference on The National Defense Education Act of 1958.

ALASKA: The Big Land—Ben Adams—*Hill & Wang*, 213 p., illus., $3.95, paper: $2.25. Handbook describing the cities, industries and landscapes of the 49th State.

BASIC PHYSICS OF ATOMS AND MOLECULES—U. Fano and L. Fano—*Wiley*, 414 p., illus., $10. Unified presentation of quantum physics through analysis of experiments, requiring a minimum of knowledge of physics and mathematics.

COLLISION COURSE: The Andrea Doria and The Stockholm—Alvin Moscow—*Putnam*, 316 p., illus., $4.50. Factual account of the controversial sea disaster by the reporter who covered the four months of hearings for the Associated Press.

CRYOGENIC ENGINEERING—Russell B. Scott—*Van Nostrand* for the Atomic Energy Commission, 368 p., illus., $5.60. Presents in detail the practical aspects of low-temperature processes and equipment as well as a discussion of underlying theory.

DAMS FOR RECLAMATION—U. S. Bureau of Reclamation, W. A. Dexheimer, Commissioner—*U. S. Dept. of Interior, Bureau of Reclam.*, 56 p., illus., paper, single copies free upon request direct to publisher, Commissioner's Office, Denver 2, Colo. Picture book of western dams.

DEVELOPMENT AND STRUCTURE OF THE FROG: A Photographic Study—Addison E. Lee, Earl R. Savage and W. L. Evans—*Rinehart*, 44 p., illus., paper, $1. For students in the biological sciences.

FOREST FIRE: Control and Use—Kenneth P. Davis with chapters by George M. Byram and W. R. Krumm—*McGraw*, 584 p., illus., $12. First book-length treatment of fire as a phenomenon in forest resource management.

HORACE MANN: Sower of Learning—Cecile Pepin Edwards—*Houghton*, 192 p., illus., by W. T. Mars, $1.56. Biography for grades 4-6.

IMMUNITY AND VIRUS INFECTION—Victor A. Najjar, Ed.—*Wiley*, 262 p., illus., $10.50. Symposium reviews basic research, emphasizing the immunology and epidemiology of polio as influenced by killed and live virus vaccine.

AN INTRODUCTION TO FOURIER METHODS AND THE LAPLACE TRANSFORMATION—Philip Franklin—*Dover*, new ed., 289 p., paper, $1.75. First published in 1949 under the title FOURIER METHODS.

INTRODUCTION TO GEOPHYSICS—Benjamin F. Howell, Jr.—*McGraw*, 399 p., illus., $9. Comprehensive introductory textbook and reference work.

THE LANGUAGE AND SYMBOLOGY OF DIGITAL COMPUTER SYSTEMS—*RCA Service Co.*, 114 p., $2. Reference and text for digital computer terminology, logic diagram symbols, and Boolean algebra as applied to modern computer systems.

LIFE GOES ON—R. Will Burnett, Jessie Williams Clemensen and Howard S. Hoyman—*Harcourt*, 2nd ed., 56 p., illus., paper, 96¢. The story of human reproduction told for high school students.

LUTHER BURBANK: Nature's Helper—Lillian J. Bragdon—*Abingdon*, 124 p., illus. by Frederick T. Chapman, $1.75. Biography for young readers.

MECHANICAL DESIGN AND ANALYSIS—R. R. Slaymaker—*Wiley*, 418 p., illus., $9.50. Textbook for a two-semester undergraduate course.

MICE IN BUILDINGS: Mighty Enemies of Man—*Wisconsin Alumni Research Foundation*, 16 p., illus., paper, single copies free upon request direct to publisher, P.O. Box 2217, Madison, Wis. Describes the economic damage and spread of disease due to mice, and tells how they may be safely controlled.

MIGHTY MAC: The Official Picture History and The Mackinac Bridge—Lawrence A. Rubin—*Wayne State Univ. Press*, 147 p., photographs by Herman Ellis, $4.95. Essay on the design of the bridge by Dr. David B. Steinman included.

THE MOTIVATION, PRODUCTIVITY, AND SATISFACTION OF WORKERS: A Prediction Study—A. Zaleznik, C. R. Christensen and F. J. Roethlisberger, assisted by George C. Homans—*Harvard Univ. Press*, 442 p., $6. Results of research on factors influencing industrial workers.

OBLIGATORY AND FACULTATIVE INSECTS IN ROSE HIPS: Their Recognition and Bionomics—W. V. Balduf—*Univ. of Ill. Press*, 194 p., illus., $4.50, paper: $3.50. Monograph.

PERSPECTIVES IN VIROLOGY: A Symposium—Morris Pollard, Ed.—*Wiley*, 312 p., illus., $7. Explores the implications of basic developments in virology for future public health application.

PLANTS THAT HEAL—Millicent E. Selsam—*Morrow*, 96 p., illus. by Kathleen Elgin, $2.50. The story of medicinal and poisonous plants, their use in primitive societies and today, for young readers.

PROTECTION IN DIAGNOSTIC RADIOLOGY—B. P. Sonnenblick, Ed., introd. by C. B. Braestrup—*Rutgers Univ. Press*, 346 p., illus., $7.50. Collection and discussion of most of the pertinent papers on the subject of protection relating to diagnostic radiology.

QUANTUM PARTICLE DYNAMICS—J. McConnell—*Interscience*, 252 p., $6. Presents fundamentals of quantum mechanics, quantum electrodynamics and meson theory to enable students to understand the main features of the theory of elementary particles.

RUSSIAN ENTRANCE EXAMINATION WITH SOLUTIONS—Rachel M. Hutchinson, Ed.—*Walch, J. W.*, 38 p., paper, $1. Samples of algebra and geometry questions used in entrance examinations at Moscow State University.

SCIENCE BOOKS 1958—Matthew F. Vessel and Herbert H. Wong—*Fearon Pubs.*, 14 p., illus., paper, 75¢. Bibliography of children's books listed by subject matter.

SCIENCE YOU CAN USE—George K. Stone and Lucy W. Stephenson—*Prentice-Hall*, 383 p., illus. by Robert Candy, $4.40. Elementary school general science.

THE STORY OF OUR TIMES: Encyclopedia Yearbook 1959—Marian Lockwood, Ed. in Chief—*Grolier Soc.*, 432 p., 450 illus., $7.50. Science Service contributed the section on Science Highlights in 1958.

TREE TRAILS AND HOBBIES—Ruth Cooley Cater—*Garden City Bks.*, 324 p., illus., $2.50. Reissue of 1950 edition, covering more than 200 species of native American trees.

THE WAY THINGS ARE—P. W. Bridgman—*Harvard Univ. Press*, 333 p., $5.75. An individual assessment of the nature of experience and the world as man knows it by the Nobel Prize winning physicist.

WONDERS UNDER A MICROSCOPE—Margaret Cosgrove—*Dodd*, 62 p., illus. by the author, $2.95. Explains how microscope works, how to use it, and shows the young scientist what to look for.

WORKING ABROAD: A Discussion of Psychological Attitudes and Adaptation in New Situations—Comm. on International Relations—*Group for the Advancement of Psychiatry*, Report No. 41, 46 p., paper, 50¢. For the use of psychiatrists, and to help personnel officers responsible for the selection and effectiveness of personnel abroad.

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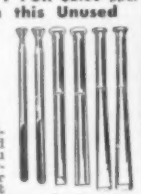

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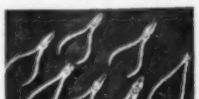

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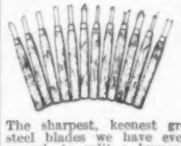

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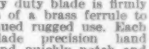

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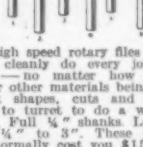

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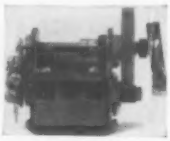

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Questions

ASTRONOMY—How long is the half-life of technetium 97? p. 227.

BIOLOGY—What kind of cells were studied in experiments with radio-frequency-produced mutations? p. 229.

EDUCATION—What are two assets of Soviet graduate training? p. 234.

PSYCHIATRY—What relation has been found between prolonged insomnia and some forms of psychosis? p. 233.

Photographs: Cover, U. S. Naval Research Laboratory; p. 227, Atlas Copco; p. 229, Alpredco, Inc.; p. 234, Howard Simons; p. 240, Detectron Corp.

Do You Know

The atmosphere of *Mars* resembles that of the earth at a height of 50,000 feet.

Melting ice in a fiord on the west coast of Spitsbergen has exposed half a *whale* carcass preserved through centuries, flesh and all, in the ice.

Isopropylamine is a pungent, ammonia-like liquid that can be ignited even by a spark; it is used industrially as an intermediate in the synthesis of pharmaceuticals, rubber chemicals, dyestuffs and insecticides.

Radiography is the third largest industrial application of radioisotopes.

Construction of a sodium graphite *power reactor* at Hallam, Nebr., has introduced the desirable possibility of a commercial gamma radiation facility in the center of the food producing area of the United States.

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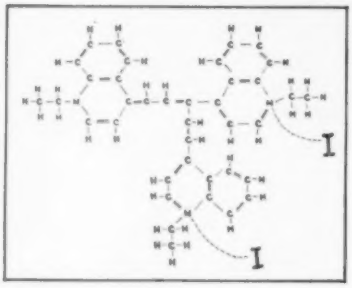

Old model resonator

Look—with the eye of a quantum mechanic—at this marvelous little molecular resonating machine. For the trifling sum of $16.65 we can supply 400 quintillion of these machines. They will weigh ½ gram, all told, and will come in a small bottle labeled *Neocyanine* (Eastman 2067).

The two iodines come separately packed in the crystal lattice as ions. The points where they were detached, at the quaternary nitrogens, are positively charged, of course. Either of these two positive charges can be sent skittering back and forth through the branched chain of conjugated carbon atoms to bounce off the third nitrogen atom. All it takes to set the machine resonating thus is a photon of light or infrared that carries the difference in energy between quiescence of the positive charges and resonance thereof.

This little resonator has proved useful for trapping photons and transferring their energy to silver halide crystals. The silver halide thereupon responds photographically to wavelengths it would otherwise miss.

This is a 1925 model. We have since devised thousands of more advanced models of this basic type of resonator, but stock only the above and five other simple ones for off-the-shelf delivery: *Cryptocyanine* (Eastman 1334), *Dicyanine A* (Eastman 1532), *Pinacyanole* (Eastman 622), *Pinaflavole* (Eastman 1842), and *Orthochrome T* (Eastman 623). As dyes they are exceedingly powerful.

For a discussion of the working parts from which such ultra-subminiaturized electronic machines can be built by the skillful worker, see a paper entitled "A Century of Progress in the Synthesis of Dyes for Photography." As long as our supply of reprints lasts, we can send you a copy free. Write to Distillation Products Industries, Eastman Organic Chemicals Department, Rochester 3, N. Y. (Division of Eastman Kodak Company). The latest catalog, No. 41, lists some 3700 other compounds for research.

The cyanine dyes possess interest not only in applied physics but in biology as well. Many of them have strong and useful antifilarial, anthelmintic, and bacteriostatic activity. That the inhibition of E. coli *by one of them has been found reversible by crude yeast and liver extract fascinates us.*

The one-hoss-shay principle

Hereby, we place on the market the *Kodak X-Omat System* for processing industrial x-ray film.

Into a slot a human being feeds miscellaneous sizes, shapes, and lengths of film. Each film emerges dry and ready to read 13 minutes later in time and 10′10″ away in space. There another human being picks it up and conveys it to an inspector who is now only 13 minutes short of the ability to look at will through solid metal and know what he is seeing.

X-ray film is a delicate proposition. It has emulsion on both sides. Processing artifacts in industrial radiographs are intolerable. You have to take the sizes as they come, in any order. You can't hook them together like a train. You can't put them in carriers. You have to move them on rollers like a printing press. The rollers have nothing to grip but wet gelatin, and they mustn't leave a mark on it. You have to build in foolproof guarantees that at each point in the system the film will be in an exactly specified physical and chemical condition. Breach these tolerances and you're manufacturing silver-flavored gelatin pudding. And because the human beings might lose count or be wasteful, the machine should automatically meter the replenishment solutions to the length of film processed.

Kodak chemists and mechanical engineers, knowing film intimately, solve such problems for each other in return for their paychecks.

Who needs it? Remember Oliver Wendell Holmes' poem about the deacon's one-hoss shay that lasted 100 years to the day because no part was first to give way. Radiographs show inhomogeneities, places where trouble gets its first foothold. With proof in hand that there aren't any such, one needs little shay insurance, less extra weight as security against hidden weakness. Today, in the more advanced fields of endeavor, extra weight is intolerable for technical reasons. By reducing the waiting time for radiographs from 1½ hours to 13 minutes, the *X-Omat System* ought to make extra weight economically intolerable too, in a pleasing number of instances.

The Kodak Industrial X-Omat Processor *lists for $37,450. If you think you might buy one, write Eastman Kodak Company, X-ray Division, Rochester 4, N. Y.*

Millimicroseconds to months

When you let light fall on film, you are running a photochemical reaction. Bunsen and Roscoe, a pair who didn't flinch in the face of the obvious, formalized the observation that the amount of product resulting from a photochemical reaction must be proportional to the amount of energy used—intensity of illumination times its duration.

Later other scientists in turn covered themselves with glory by discovering that for photographic exposure this was not strictly true, and still others won Ph.D.'s by explaining why not. Intensity and duration slip the shackles of reciprocity a little. Over the broad spectrum of durations from millimicroseconds to months, a certain optimum rate of feeding energy to a silver halide emulsion is encountered. The manufacturer can roll the optimum somewhat one way or the other.

Calls for shifting it to favor the effectiveness of very dim light come from astronomers, among others. From an observatory director's viewpoint, cutting hours off exposures is like having more telescopes.

Business is brisker, though, on the other end of the scale. To more and more users of photography a hundredthousandth of a second sounds like a terribly long time. Well-read types, they fear the deviation from reciprocity. To allay those fears, we offer them something new to read, a free pamphlet bearing the title "Kodak Films for Short Exposure-Time Applications."

It is obtainable from Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.

Prices are subject to change without notice.

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New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 982. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

POTATO-SHOOTING GUN shoots pellets as far as 50 feet. Pressing the nozzle into a potato loads the durable, all-metal gun. A single potato will yield about 300 pellets. Said to be completely harmless even for the smallest child, the gun can also be used with orange peels, watermelon rinds, apples and carrots.

Science News Letter, April 11, 1959

EYEGLASS REPAIR KIT enables one to tighten loose screws or replace lost ones. It consists of an optical screwdriver and an assortment of standard frame screws and nuts.

Science News Letter, April 11, 1959

FILTER FACE MASK, a disposable cotton filter with a head strap, is so pliable it fits the contour of the face. The half-ounce filter protects the wearer against non-toxic dusts and hazards of sprays and it can be worn with eyeglasses or goggles. The replaceable filters are packaged in a self-dispensing container.

Science News Letter, April 11, 1959

METAL DETECTOR for locating buried metal deposits comes with binaural headphones, batteries and operating instructions. The sturdy six-pound detector, shown in the photograph, guides the way to buried

metals by the dual tracking device of an audible change of tone pitch and an increase of the tone frequency.

Science News Letter, April 11, 1959

TOWEL SET for golf carts consists of two 12" by 18" shrink-proof denim towels, each in a different tartan plaid. The towels are attached to the golf cart by means of a one-inch brass eyelet and a rust-proof brass snap fixture.

Science News Letter, April 11, 1959

ANIMAL PLACEMATS for children have color portraits of woodchucks, fawns, bears and rabbits alongside line drawings of the same subjects on plastic-laminated mats. Washable crayons are provided so the child may fill in the line drawings. The mats, which are tough, flexible and easy to clean, come in sets of four.

Science News Letter, April 11, 1959

OPTICAL BENCH enables amateur astronomers, photographers, hobbyists, students and teachers to make their own telescopes. Consisting of a hardwood stick base, two end supports and four lens holders, the bench can facilitate testing the focal length of lenses and may be used as a collimator.

Science News Letter, April 11, 1959

SHAVING GEAR RACK of aluminum is designed to accommodate any man's shaving equipment, whether he uses an electric razor or a safety razor, with or without a brush. The 5½ by 6½-inch rack fits into the shelf of a medicine cabinet or may be hung on a wall.

Science News Letter, April 11, 1959

Nature Ramblings

By HORACE LOFTIN

➤ WE AMERICANS have an oddly limited outlook about our birds. Even without our new states of Alaska and Hawaii, our boundaries extend from near-tundra regions to the near-tropics. As a result we are able to boast of a variety of birds, variously adapted to our many climates.

Yet, the majority of us persist in thinking of robins as unique "heralds of spring" and their departure as the signal for winter's approach.

This may be true for a part of the country—perhaps the area from which most has been written about birds. But it ignores the ways of birds in perhaps one-half or more of the nation. For example, in many southern states winter is really setting in when the robins begin to arrive. Likewise, the departure of robins and many other species from states along our southern border is an excellent announcement of the imminent arrival of spring there.

Greeting the Robin

A less obvious, but more intriguing, example of birds disrupting such preconceptions is that of the snow bunting.

This sparrow-sized bird thrives on cold weather. Its breeding grounds are in the Arctic wastes, and it nests even in northern Greenland. But the Arctic winter is too much for this hardy lover of the snow, so it makes a minor concession by migrating south, to Unalaska, Manitoba, Quebec and southward to a tier of our northern states.

Its winter home, then, is the very land so recently abandoned by other birds which could not endure the winter climate there. The ice and snow of this area seem to act as a tonic to the chipper snow bunting, who makes his living from last summer's seeds.

Then comes some hidden signs of spring, the signal for the snow buntings to leave their winter resorts for the Arctic breeding grounds. Most of them leave the United States before the end of February.

Stragglers may stay on through March, perhaps to greet that famous first robin.

As a general rule, ornithologists have found that birds migrating South early in the spring are the ones that leave their nesting grounds late, while those who arrive late start their return trips early. Goshawks, snowy owls, redpolls, Bohemian waxwings and various other birds do not leave the far north until forced to do so by severe weather conditions or by scarcity of food. Their return northward is likely to start at a time when the country is still in the grip of winter.

Science News Letter, April 11, 1959